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Title: SOLVENT PREWET AND METHOD TO DISPENSE THE SOLVENT PREWET

little solvent to achieve very good resist thickness profiles. With the diacetone alcohol solvent, the process uses as little as 0.3-1.0 cc solvent prewet solution per wafer (as compared to 1.0 cc or greater solvent solution per wafer).

IN THE CLAIMS

Please cancel claims 23, 30, 34, 40, 43 and 49 and amend previously pending claims 13, 19, 22, 24, 28, 32, 37, 42, 44 - 48, 50 - 54, 58 and 60 - 61 by substituting the claim set in the appendix entitled Clean Version of Pending Claims for the previously pending claim set. The specific amendments to individual claims are detailed in the following marked up set of claims.

13. (Amended) An apparatus, comprising:

a solvent dispense head in fluid communication with a source of a photo resist solution and in fluid communication with a solvent source containing a solvent that includes diacetone alcohol and aliphatic ester, wherein a ratio of the diacetone alcohol and aliphatic ester ranges between 10% ester and 90% alcohol to 30% ester and 70% alcohol; and

a rotatable wafer-holding mechanism; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:

distributing the solvent on a wafer surface; and

upon distributing the solvent, distributing the photo resist solution on the wafer surface.

19. (Amended) An apparatus, comprising:

a solvent dispense head in fluid communication with a source of a photo resist solution and in fluid communication with a solvent source containing a solvent that includes diacetone alcohol and aliphatic [ester] ester, wherein a ratio of the diacetone alcohol and aliphatic ester ranges between 10% ester and 90% alcohol to 30% ester and 70% alcohol; and

a rotatable wafer-holding mechanism; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process

comprises:

dispensing the solvent on a wafer surface;
actuating the rotatable wafer-holding mechanism to spin the wafer until the solvent is distributed across the wafer surface;
upon distributing the solvent, dispensing the photo resist solution on the wafer surface; and
actuating the rotatable wafer-holding mechanism to spin the wafer until the photo resist solution is distributed across the wafer surface.

22. (Amended) An apparatus, comprising: [The apparatus of claim 19, wherein:]
a solvent dispense head in fluid communication with a source of a photo resist solution
and in fluid communication with a solvent source containing a solvent that includes diacetone
alcohol and aliphatic ester, wherein the solvent head includes:
a first nozzle directed at the edge and sides of the wafer;
a second nozzle directed at the back of the wafer; and
a third nozzle directed at the center of the wafer; and
a rotatable wafer-holding mechanism; and
a logic control unit adapted for executing a process to coat a wafer, wherein the process
comprises:

dispensing the solvent on a wafer surface, [in the process preformed by the logic
control unit, dispensing the solvent on a wafer surface includes] including
dispensing the solvent from the third nozzle[.];
actuating the rotatable wafer-holding mechanism to spin the wafer until the
solvent is distributed across the wafer surface;
upon distributing the solvent, dispensing the photo resist solution on the wafer
surface;
[wherein,] upon distributing the photo resist material, [the process further
includes] dispensing the solvent from the first nozzle for edge bead
removal and dispensing the solvent from the second nozzle for cleaning

the back of the wafer; and
actuating the rotatable wafer-holding mechanism to spin the wafer until the photo resist solution is distributed across the wafer surface.

24. (Amended) An apparatus, comprising:

a solvent dispense head in fluid communication with a source of a photo resist solution and further in fluid communication with a solvent source containing a solvent that includes diacetone alcohol, wherein the solvent dispense head includes:

a first nozzle in fluid communication with the source of the photo resist solution, the first nozzle being directed at a wafer edge and a wafer side;
a second nozzle in fluid communication with the source of the photo resist solution, the second nozzle being directed at a wafer back surface; and
a third nozzle in fluid communication with the solvent source, the third nozzle being directed at a center of a wafer top surface; and

a rotatable wafer-holding mechanism; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:

distributing the solvent on a wafer surface using the third nozzle; and
upon distributing the solvent, distributing the photo resist solution on the wafer surface using the first and second nozzles.

28. (Amended) An apparatus, comprising:

a rotatable base for holding a wafer;
a solvent dispense head in fluid communication with a source of a photo resist solution and in fluid communication with a solvent source containing a solvent that includes diacetone alcohol, the solvent dispense head including:

a first nozzle in fluid communication with the source of the photo resist solution and directed at the top of the wafer;
a second nozzle in fluid communication with the source of the photo resist

solution and directed at the back of the wafer; and
a third nozzle in fluid communication with the solvent source directed at the
center of the wafer;

solenoids for controlling flow of the photo resist solution and the solvent through the solvent dispense head; and

a logic control unit coupled to the solenoids and adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the solvent on a wafer surface;

spinning the wafer on the rotatable base until the solvent is distributed across the wafer surface;

dispensing the photo resist solution on the wafer; and

spinning the wafer until the photo resist solution is distributed across the wafer surface.

32. (Amended) An apparatus, comprising:

a rotatable base for holding a wafer;

a solvent dispense head, including:

a first nozzle in fluid communication with a source of a photo resist solution, wherein the first nozzle is directed at the edge and sides of the wafer and is in fluid communication with the solvent source;

a second nozzle in fluid communication with the source of the photo resist solution, wherein the second nozzle is directed at the back of the wafer and is in fluid communication with the solvent source; and

a third nozzle in fluid communication with a solvent source containing a solvent that includes diacetone alcohol;

solenoids for controlling flow through the first nozzle, the second nozzle and the third nozzle; and

a logic control unit coupled to the solenoids and adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the solvent on a wafer surface using the third nozzle;

spinning the wafer on the rotatable base until the solvent is distributed across the wafer surface;

dispensing photo resist solution on the wafer using the first nozzle and the second nozzle, including dispensing solvent through the first nozzle for edge bead removal, and dispensing solvent through the second nozzle on the back of the wafer to clean the wafer; and

spinning the wafer until the photo resist solution is distributed across the wafer surface.

37. (Amended) An apparatus, comprising:

a rotatable base for holding a wafer;

a solvent dispense head in fluid communication with a source of a photo resist solution and a bulk solvent that includes diacetone alcohol, wherein between 70% and 90% of the bulk solvent is diacetone alcohol;

solenoids for controlling flow of the photo resist solution and the bulk solvent through the solvent dispense head; and

a logic control unit coupled to the solenoids and adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the bulk solvent on a wafer surface;

spinning the wafer on the rotatable base until the bulk solvent is distributed across the wafer surface;

dispensing the photo resist solution on the wafer; and

spinning the wafer until the photo resist solution is distributed across the wafer surface.

42. (Amended) An apparatus, comprising:

a rotatable base for holding a wafer;

a solvent dispense head in fluid communication with a source of a photo resist solution and a bulk solvent that includes a mixture of diacetone alcohol and aliphatic ester, wherein the

mixture of diacetone alcohol and aliphatic ester includes a ratio that ranges between 10% ester and 90% alcohol to 30% ester and 70% alcohol;

solenoids for controlling flow of the photo resist solution and the bulk solvent through the solvent dispense head; and

a logic control unit coupled to the solenoids and adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the bulk solvent on a wafer surface;

spinning the wafer on the rotatable base until the bulk solvent is distributed across the wafer surface;

dispensing the photo resist solution on the wafer; and

spinning the wafer until the photo resist solution is distributed across the wafer surface.

44. (Amended) A system for coating a wafer, comprising:

a bulk solvent container, wherein a bulk solvent contained therein includes aliphatic ester and diacetone alcohol mixed in a ratio that ranges between 10% ester and 90% alcohol to 30% ester and 70% alcohol;

a low pressure canister connected to the bulk solvent container; and

a track coating unit connected to the low pressure canister, the track coating unit comprising:

a solvent dispense head;

a rotatable base for mounting the wafer; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the bulk solvent on a wafer surface;

spinning the wafer on the rotatable base until the bulk solvent is distributed across the wafer surface;

dispensing photo resist solution on the wafer; and

spinning the wafer until the photo resist solution is distributed across the

wafer surface.

45. (Amended) The system of claim 44, wherein the bulk solvent further comprises aliphatic [ester] ester.

46. (Amended) The system of claim 44, wherein the solvent dispense head includes:
a first nozzle in fluid communication with the source of the photo resist solution and
directed at the top of the wafer;

a second nozzle in fluid communication with the source of the photo resist solution and
directed at the back of the wafer; and

a third nozzle in fluid communication with the solvent source directed at the center of the
wafer. [the bulk solvent comprises aliphatic ester and diacetone alcohol mixed in a ratio that
ranges between 10% ester and 90% alcohol to 30% ester and 70% alcohol.]

47. (Amended) The system of claim 44, wherein the low pressure container is adapted to v.
maintain [proper] a fluid pressure and a fluid level for the track coating unit.

48. (Amended) A system for coating a wafer, comprising:
a bulk solvent container, wherein a bulk solvent contained therein includes diacetone
alcohol and aliphatic [ester] ester mixed in a ratio that ranges between 10% ester and 90%
alcohol to 30% ester and 70% alcohol;

a low pressure canister connected to the bulk solvent container; and
a track coating unit connected to the low pressure canister, the track coating unit
comprising:

a solvent dispense head;
a rotatable base for mounting the wafer; and
a logic control unit adapted for executing a process to coat a wafer, wherein the
process comprises:

dispensing the bulk solvent on a wafer surface through a nozzle directed at

a center of a wafer top surface;
spinning the wafer on the rotatable base until the bulk solvent is
distributed across the wafer surface;
dispensing photo resist solution on the wafer; and
spinning the wafer until the photo resist solution is distributed across the
wafer surface.

50. (Amended) The system of claim 48, wherein the aliphatic [ester] ester and the diacetone alcohol are mixed in a ratio of 10% [ester] ester and 90% alcohol.

51. (Amended) The system of claim 48, wherein the aliphatic [ester] ester and the diacetone alcohol are mixed in a ratio of 30% [ester] ester and 70% alcohol.

52. (Amended) The system of claim 48, wherein the aliphatic [ester] ester is 10% of the bulk solvent.

53. (Amended) The system of claim 48, wherein the aliphatic [ester] ester is 30% of the bulk solvent.

54. (Amended) The system of claim 48, wherein the aliphatic [ester] ester is between 10% and 30% of the bulk solvent.

58. (Amended) A system for coating a wafer, comprising:
a bulk solvent container, wherein a bulk solvent contained therein includes diacetone alcohol; and
a track coating unit coupled to the bulk solvent container, the track coating unit comprising:

a solvent dispense head, including:

a first nozzle in fluid communication with the source of the photo

resist solution and directed at the top edge and sides of the wafer for edge bead removal;

a second nozzle in fluid communication with the source of the photo resist solution and directed at the back of the wafer to clean the wafer; and

a third nozzle in fluid communication with the solvent source directed at the center of the wafer to prewet the wafer;

a rotatable base for mounting the wafer; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the bulk solvent on a wafer surface using the third nozzle;

spinning the wafer on the rotatable base until the bulk solvent is

distributed across the wafer surface;

dispensing photo resist solution on the wafer;

spinning the wafer until the photo resist solution is distributed across the wafer surface; and

dispensing the bulk solvent on the edge and sides of the wafer using the

first nozzle and on the back of the wafer using the second nozzle

for edge bead removal and cleanup after distributing the photo

resist.

60. (Amended) The system of claim 58, wherein the bulk solvent further includes aliphatic [ester] ester.

61. (Amended) A system for coating a wafer, comprising: [The system of claim 58,] a bulk solvent container, wherein a bulk solvent contained therein includes diacetone alcohol and [wherein the bulk solvent further includes] aliphatic [ester] ester to form a mixture that has a ratio between 10% [ester] ester and 90% alcohol to 30% [ester] ester and 70% alcohol; and

a track coating unit coupled to the bulk solvent container, the track coating unit comprising:

a solvent dispense head;

a rotatable base for mounting the wafer; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the bulk solvent on a wafer surface;

spinning the wafer on the rotatable base until the bulk solvent is

distributed across the wafer surface;

dispensing photo resist solution on the wafer;

spinning the wafer until the photo resist solution is distributed across the wafer surface; and

dispensing the bulk solvent on the edge and sides of the wafer and on the back of the wafer for edge bead removal and cleanup after distributing the photo resist.

REMARKS

Applicant has carefully reviewed and considered the Office Action mailed on July 16, 2002, and the references cited therewith.

Claims 13, 19, 22, 24, 28, 32, 37, 42, 44 - 48, 50 - 54, 58 and 60 - 61 are amended, and claims 23, 30, 34, 40, 43 and 49 are canceled; as a result, claims 13 - 22, 24 - 29, 31 - 33, 35 - 39, 41 - 42, 44 - 48 and 50 - 61 are now pending in this application.

Throughout the specification and claims, Applicant has replaced the term "ester" with --ester--.

§112 Rejection of the Claims

Claim 47 was rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as

the invention. Applicant maintains the position presented in the previous Response that the language is definite, and that one or ordinary skill in the art, upon reading and comprehending the disclosure, will find the language "a proper fluid pressure and level" to be definite. Page 9, lines 20 - 24 of the Specification is referenced for support of this position.

In the interest of expediting prosecution and allowance of this application, Applicant has amended claim 47 to read "*to maintain a fluid pressure and a fluid level for the track coating unit.*" Applicant asserts that the recited language is definite under 35 USC § 112, second paragraph, and respectfully requests withdrawal of the rejection.

§103 Rejection of the Claims

Claims 13 and 15-20 were rejected under 35 USC § 103(a) as being unpatentable over Orth (U.S. Patent No. 5,750,317) in view of Gordon (U.S. Patent No. 5,066,616) and Yoda et al. (U.S. Patent No. 5,876,882).

Independent claim 13 has been amended to clarify the solvent. Applicant is unable to find, among other things, in the cited portions of the Orth, Gordon, and Yoda et al. references, either taken alone or together, a showing or suggestion of a solvent that includes diacetone alcohol and aliphatic ester in a ratio between 10% ester and 90% alcohol to 30% ester and 70% alcohol, as recited in the claim. Applicant respectfully asserts that amended independent claim 13 is patentable. Claims 15 - 18 depend upon amended independent claim 13, and further define present subject matter. Thus, claims 15 - 18 are believed to be patentable at least for the reasons provided with respect to claim 13.

Independent claim 19 has been amended to recite language recited in claim 23, which was previously found to be allowable. Applicant respectfully asserts that amended independent claim 19 is patentable. Claim 20 depends upon amended independent claim 19, and further defines the present subject matter. Thus, claim 20 is believed to be patentable at least for the reasons provided with respect to claim 19.

Claims 14 and 21 were rejected under 35 USC § 103(a) as being unpatentable over the references as applied to claims 13 and 19 above, and further in view of Hayes et al. (U.S. Patent No. 5,849,084).

Claim 14 depends upon amended independent claim 13, and further defines present subject matter. Thus, claim 14 is believed to be patentable at least for the reasons provided with respect to claim 13.

Claim 21 depends upon amended independent claim 19, and further defines present subject matter. Thus, claim 21 is believed to be patentable at least for the reasons provided with respect to claim 19.

Claims 24, and 26-27 were rejected under 35 USC § 103(a) as being unpatentable over Orth in view of Gordon, Yoda et al., and Hayes et al.

Independent claim 24 has been amended to clarify the solvent dispense head. Applicant is unable to find, among other things, in the cited portions of the Orth, Gordon, Yoda et al. and Hayes et al. references, either taken alone or together, a showing or suggestion of a solvent dispense head where a first nozzle is directed at an edge and side of the wafer, a second nozzle is directed to a back surface of the wafer, and a third nozzle is directed at a center of a top surface of the wafer, as recited in the claim. Applicant respectfully asserts that amended independent claim 24 is patentable. Claims 26 and 27 depend upon amended independent claim 24, and further define present subject matter. Thus, claims 26 and 27 are believed to be patentable at least for the reasons provided with respect to claim 24.

Claims 28, 29, 31, 37, 41, 42, and 58-60 were rejected under 35 USC § 103(a) as being unpatentable over Orth in view of Gordon, Yoda et al., and Hasebe et al. (U.S. Patent No. 5,658,615).

Independent claim 28 has been amended to recite language recited in claim 30, which was previously found to be allowable. Applicant respectfully asserts that amended independent claim 28 is patentable. Claims 29 and 31 depend upon amended independent claim 28, and further define present subject matter. Thus, claims 29 and 31 are believed to be patentable at least for the reasons provided with respect to claim 28.

Independent claim 37 has been amended to recite language recited in claim 40, which was previously found to be allowable. Applicant respectfully asserts that amended independent claim

37 is patentable. Claim 41 depends upon amended independent claim 37, and further defines present subject matter. Thus, claim 41 is believed to be patentable at least for the reasons provided with respect to claim 37.

Independent claim 42 has been amended to recite language recited in claim 43, which was previously found to be allowable. Applicant respectfully asserts that amended independent claim 42 is patentable.

Independent claim 58 has been amended to clarify the solvent dispense head. Applicant is unable to find, among other things, in the cited portions of the Orth, Gordon, Yoda et al. and Hasebe et al. references, either taken alone or together, a showing or suggestion of a solvent dispense head that includes a first nozzle directed at the top edge and sides of the wafer for edge bead removal, a second nozzle directed at a back surface of the wafer to clean the wafer, and a third nozzle directed at the center of the wafer to prewet the wafer, as recited in the claim. Applicant respectfully asserts that amended independent claim 58 is patentable. Claims 59 and 60 depend upon amended independent claim 58, and further define present subject matter. Thus, claims 59 and 60 are believed to be patentable at least for the reasons provided with respect to claim 58.

Claims 32, 33, and 36 were rejected under 35 USC § 103(a) as being unpatentable over Orth in view of Gordon, Yoda et al., Hayes et al., and Hasebe et al.

Independent claim 32 has been amended to recite language recited in claim 34, which was previously found to be allowable. Applicant respectfully asserts that amended independent claim 32 is patentable. Claims 33 and 36 depend upon amended independent claim 32, and further define present subject matter. Thus, claims 33 and 36 are believed to be patentable at least for the reasons provided with respect to claim 32.

Claims 25 and 35 were rejected under 35 USC § 103(a) as being unpatentable over the references as applied to claims 24 and 32 above, and further in view of Ikeno et al. (U.S. Patent No. 4,886,012).

Claim 25 depends upon amended independent claim 24, and further define present subject matter. Thus, claim 25 is believed to be patentable at least for the reasons provided with respect to claim 24.

Claim 35 depends upon amended independent claim 32, and further define present subject matter. Thus, claim 35 is believed to be patentable at least for the reasons provided with respect to claim 32.

Allowable Subject Matter

Claims 22, 23, 30, 34, 38-40, 43, and 61 were objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 22 has been amended into independent format to recite language recited in the original independent claim 19. Thus, claim 22 is believed to be patentable.

Language recited in claim 23 has been incorporated into the language recited in amended independent claim 19.

Language recited in claim 30 has been incorporated into the language recited in amended independent claim 28.

Language recited in claim 34 has been incorporated into the language recited in amended independent claim 32.

Language recited in claim 40 has been incorporated into the language recited in amended independent claim 37.

Language recited in claim 43 has been incorporated into the language recited in amended independent claim 42.

Claim 61 has been amended into independent format to recite language recited in the original independent claim 58. Thus, claim 61 is believed to be patentable.

Claim 47 was indicated to be allowable if rewritten to overcome the rejection(s) under 35 USC § 112 set forth in the Office Action.

Applicant acknowledges the allowance of claims 44 - 46 and 48 - 57. Applicant amended independent claims 44 and 48 to clarify that the bulk solvent includes a mixture of aliphatic ester

and diacetone alcohol as recited in the claims. Additionally, Applicant amended independent claim 48 to clarify that the bulk solvent is dispensed on a wafer surface through a nozzle directed at a center of a wafer top surface, as recited in the claims. Applicant notes that the amendments to claims 44 and 48 have not been made to overcome a rejection in the office action.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (612) 373-6960 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Box AF, Commissioner of Patents, Washington, D.C. 20231, on this 14 day of September, 2002.

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